



Enhancing Global Food Resources: CGIAR Strategy and its future Portfolio of Programs 2017–2030

presented to the

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What is CGIAR?

CGIAR is the only worldwide research partnership addressing agricultural research for development, whose work contributes to the global efforts to tackle poverty, food and nutrition insecurity, and environmental degradation.



Our Vision

A world free of poverty, hunger and environmental degradation.



Our Mission

To advance agri-food science and innovation to enable poor people, especially poor women, to increase agricultural productivity and resilience, share in economic growth, feed themselves and their families better, and conserve natural resources in the face of climate change and other threats.



CGIAR key facts:

- Annual turnover of US\$1 billion in public funding provided by broad range of key development donors.
- 15 non-profit research Centers with 10 thousand world class scientists and support staff on the ground in over 60 countries
- Unique in public sector to work from discovery to translational research and have a product development capacity; reaching millions of farmers through work with development partners
- CGIAR genebanks safeguard the world's largest germplasm collections for staple food crops, that provide over 90% of all recorded transfers under the International Treaty on Plant Genetic Resources



CGIAR Research Centers

CGIAR research is carried out by the 15 Centers, members of the CGIAR Consortium, in close collaboration with hundreds of partners, including national and regional research institutes, civil society organizations, academia, development organizations and the private sector.



CENTERS

- 1 AfricaRice
- 2 Bioversity International
- 3 Center for International Forestry Research (CIFOR)
- 4 International Center for Agricultural Research in the Dry Areas (ICARDA)
- 5 International Center for Tropical Agriculture (CIAT)
- 6 International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
- 7 International Food Policy Research Institute (IFPRI)
- 8 International Institute of Tropical Agriculture (IITA)
- 9 International Livestock Research Institute (ILRI)
- 10 International Maize and Wheat Improvement Center (CIMMYT)
- 11 International Potato Center (CIP)
- 12 International Rice Research Institute (IRRI)
- 13 International Water Management Institute (IWMI)
- 14 World Agroforestry Centre (ICRAF)
- 15 WorldFish

CGIAR Research Programs

(1st round of CRPs, 2011-2016)



Aquatic Agricultural Systems (AAS)
Agriculture for Nutrition and Health (A4NH)
Climate Change, Agriculture and Food Security
(CCAFS)
Dryland Cereals
Dryland Systems
Forests, Trees and Agroforestry (FTA)
The Global Rice Science Partnership (GRiSP)
Grain Legumes

Integrated Systems for the Humid Tropics
(Humidtropics)
Livestock and Fish
Managing and Sustaining Crop Collections (Genebanks)
Maize
Policies, Institutions and Markets (PIM)
Roots, Tubers and Bananas (RTB)
Water, Land and Ecosystems (WLE)
Wheat



New CGIAR technologies already in the field:

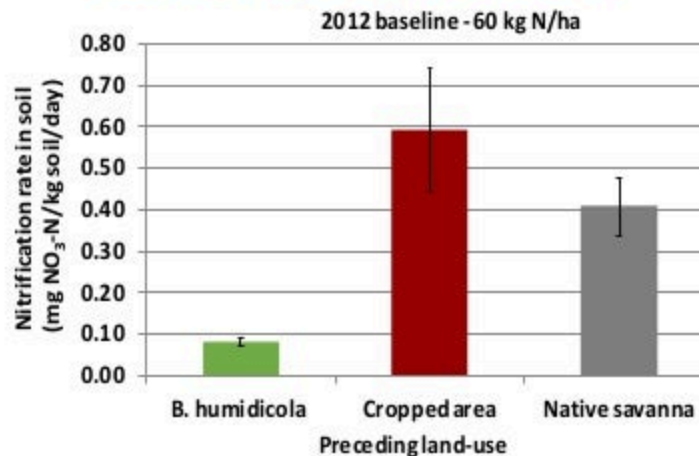
- **Scuba rice**, which can survive under water for two weeks, is protecting the harvests, incomes, and food security more than 5 million farmers in Asia.
- New high-yielding, and more nutritious – **biofortified - varieties** of foods such as maize, cassava, beans, pearl millet, rice, beans and orange sweet potato are targeted to reach 50 million consumers by 2018.
- **AFLASAFE** reduces aflatoxin contamination in African farmers fields by up to 90% - a product that has 4 atoxigenic strains of the fungus developed by CGIAR with USDA.
- Index-based crop and livestock **drought insurance** and seasonal weather forecasts now benefit millions of poor rural households in Africa and Asia.
- **Wheat stem rust -Ug99- resistant varieties** have been made available, preventing disaster at a scale affecting many millions of people. **Maize lethal necrosis resistant varieties** have been developed through rapid cycling (4 years).
- **Agroforestry:** unfertilized maize yields under *Faidherbia* trees average **4.1** tonnes per hectare, compared to **1.3** tonnes; in Niger, more than 1.2 million households have regenerated 200 million fertilizer trees on their sorghum and millet fields across 5 million hectares.
- **Brachiaria forages** with Biological Nitrification Inhibition capacity have reduced greenhouse gas emissions and improved nitrogen efficiency on 500 thousand hectares.

Brachiaria humidicola residual BNI effect on maize as subsequent crop in Tropical Savannas of Colombia

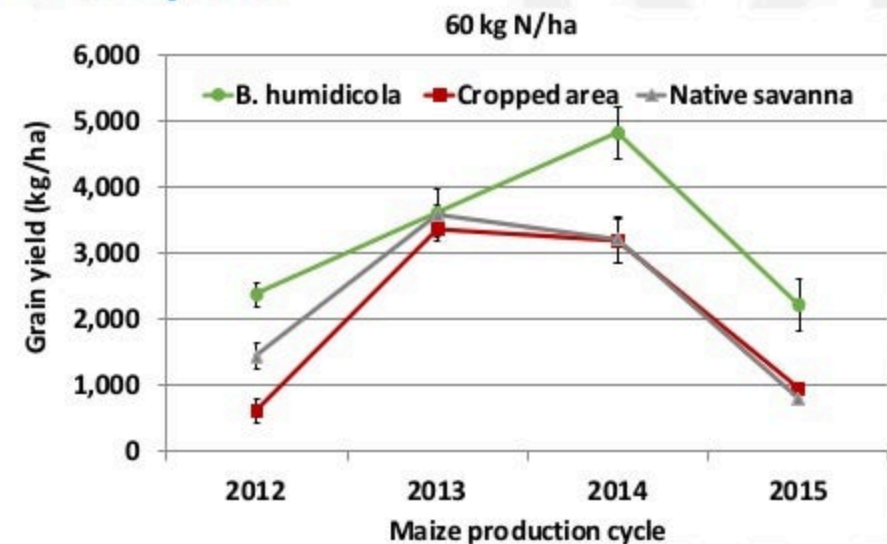


- Three contrasting land uses (half-hectare of field area):
 - 1) Long-term *B. humidicola* pasture (>10-year-old)
 - 2) Cropped area (maize/soybean), and
 - 3) Native savanna
- Nitrogen fertilizer: 60, 120, and 240 kg N/ha
- plus one control ("0" N)
- Determination of grain yield and N-recovery

Nitrification rate in soil



Grain yield



Brachiaria humidicola hybrids with different levels of BNI identified



Best *B. humidicola* hybrids identified in a 2 year field evaluation (dry and rainy seasons) in the foothills of Colombia for their high BNI, superior yields and nutritional quality



Aerial photo
Mauricio Alvarez,
Corpoica



RESEARCH PROGRAM ON
Livestock and Fish

Genotype/ year	Dry season								Rainy season						
	Nitrification rate ^a		Forage quality						Forage quality						
	2014	2015	Yield ^b		C. protein%		IVDMD ^c		Yield ^b		C. protein%		IVDMD ^c		
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
BH08/1149	4.73	2.56	1,069	644	11.63	10.05	53.78	57.90	3,668	1,479	13.21	15.33	61.31	60.62	
BH08/0700	3.50	2.83	873	775	9.45	6.68	53.70	57.21	3,023	1,362	8.03	15.21	60.68	58.17	
BH08/0680	4.74	2.53	1,899	634	8.16	4.15	53.95	52.63	2,266	1,968	5.31	14.85	56.32	57.8	
CIAT 679 ^x	4.40	2.14	1,186	804	8.83	6.39	46.86	55.77	3,418	1,143	9.06	12.83	56.21	56.80	
CIAT 16888 ^y	4.11	4.27	1,515	749	9.34	4.63	57.24	56.12	3,812	1,531	9.05	14.84	62.78	57.83	
CIAT 26149 ^x	2.81	6.48	1,072	1,136	8.64	6.67	52.57	51.66	2,224	1,650	5.75	12.69	60.02	58.05	

^a mg NO₃-N/kg soil/day, ^b kg dry matter/ha/month, ^c *in vitro* Dry matter digestibility (%),

^x Commercial cultivar, ^y High BNI Brachiaria. Values indicate the average ± SE of three replicates

What are the challenges going forward?

Agri-food systems today are not sustainable, nor are they providing healthy food for all.

Analysis of food system challenges shows that radical transformation is urgently needed



Top 3 challenges:

- **Poor diets** are now the #1 cause of ill health globally, overtaking smoking, with 800 million hungry people, 2 billion malnourished people, 159 million stunted children and 2 billion people overweight or obese, causing rapid increases in diabetes in India and heart disease in China. Three quarters of all overweight children live in Africa and Asia.
- **Planetary ill health.** The food system is the primary driver, and responsible for soil degradation on 25% of cropped land, deforestation and loss of biodiversity, water scarcity, pollution of lakes and seas, and circa 25% of all greenhouse gas emissions
- **Massive un(der)employment** for young people in rural areas, with employment in the agri-food system, on farms or in the food value chain, as the only realistic option for 60% of African next generation youth, requiring over 200 million jobs

Daunting challenges - impressive opportunities, such as:



- The **life science revolution** is changing our understanding of the fundamental biology of plants, animals and people. It has already transformed medicine and is just now reaching agriculture.
- **Big data** approaches are critically transforming the retail end of food value chains
- **Open access** to agriculture and nutrition related publications and data will increase access and accelerate agri-food system innovation, and the potential for impact
- Renewed policy focus on the central role of the **Bio-economy** in the broader



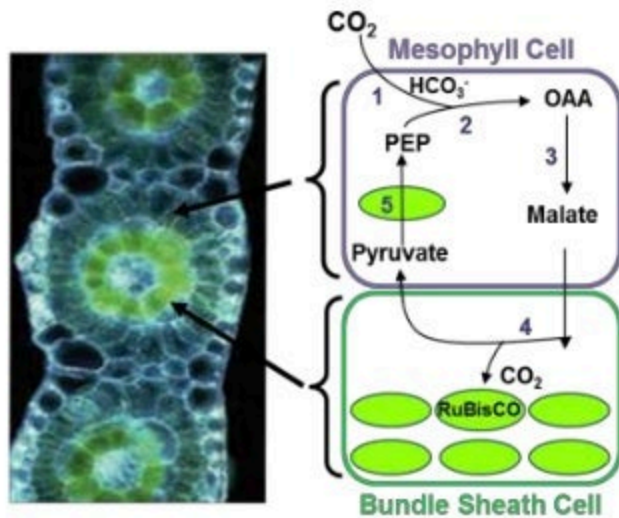
CGIAR discovery research now in the lab:

- ***C4 Rice***: targets introduction of more efficient photosynthesis in rice that would yield up to 50% more grain than current varieties, and double water-use efficiency, and increase nitrogen-use efficiency by 30%
- Massive ***high-throughput sequencing of all 167 thousand accessions*** in CGIAR's maize and wheat genebanks targets breakthroughs in understanding genetic diversity at molecular level for the whole collection, with over 60 thousand accessions already sequenced and in genotyping analysis

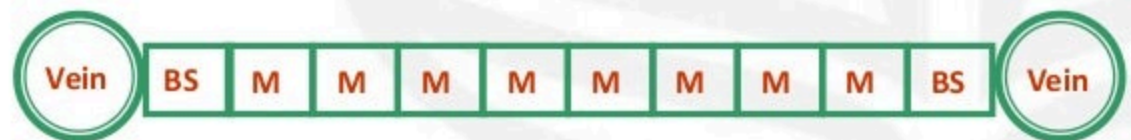
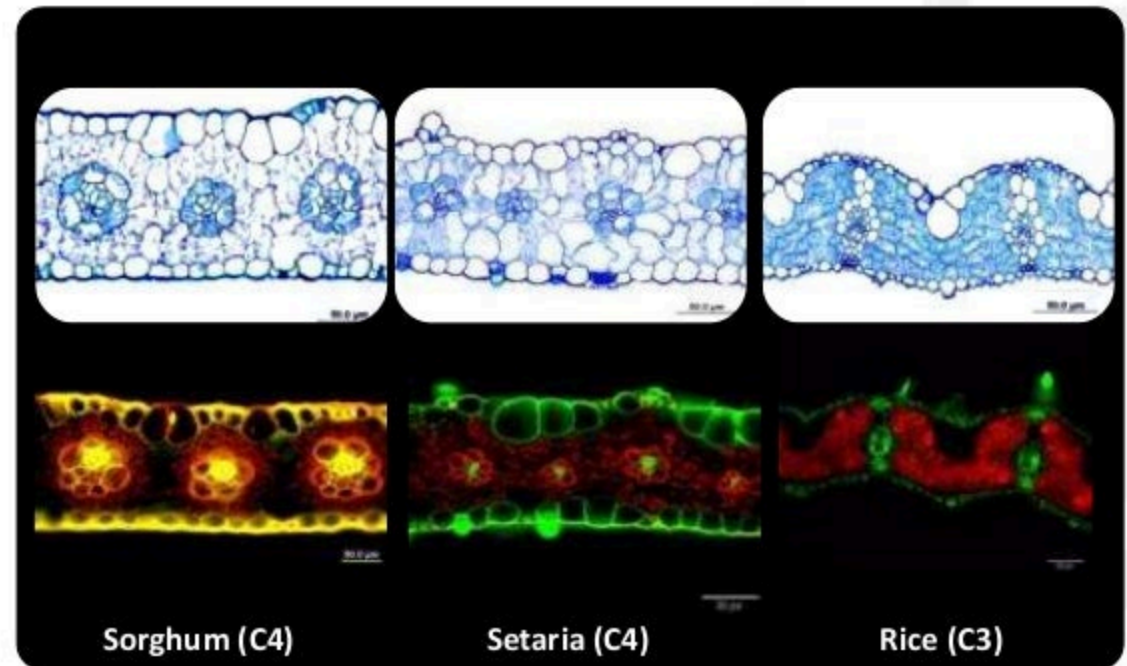


C4 photosynthesis involves alterations to biochemistry, cell biology and leaf anatomy

Biochemistry

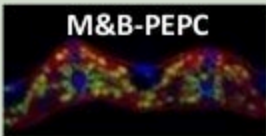
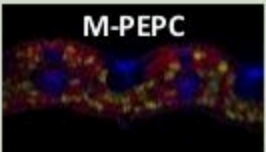
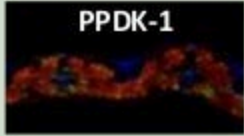
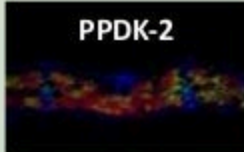
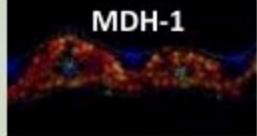
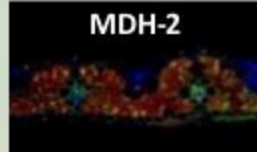

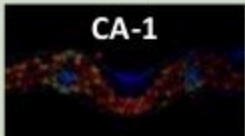
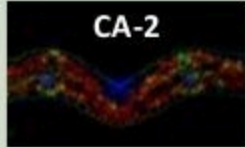


Leaf anatomy



C3

Homozygous lines of transgenic rice expressing Maize C₄ biochemical enzymes

	PEPC	PPDK	MDH	ME	CA
No. of event	4	4	4	1	4
Generation	T6	T6	T5	T4	T4
Insertion copy	1 copy	1 copy	1 copy	7 copies	1 copy
Protein expression (% maize)	80-120%	75-125%	530-620%	37%	Detectable (CA-AcV5 antibody)
Cellular localization	 	 	 		 
Phenotype	normal	normal	normal	slightly stunted	normal

What is PRISM?

4-year (2014-2017) R&D collaborative project in support of the Department of Agriculture's (DA) Food Staples Sufficiency Program.

Integrated into the project is the development of a Sustainability Plan to institutionalize PRISM within the DA and ensure its operation beyond 2017.



DA
Department of Agriculture
www.da.gov.ph



DA BAR
Bureau of Agricultural Research
www.bar.gov.ph



Agri Pinoy Rice Program



Bureau of Plant Industry (BPI)
www.bpi.da.gov.ph



Philippine Statistics Authority (PSA- BAS)
www.psa.gov.ph



Philippine Rice Research Institute
www.philrice.gov.ph



sarmap
www.sarmap.ch

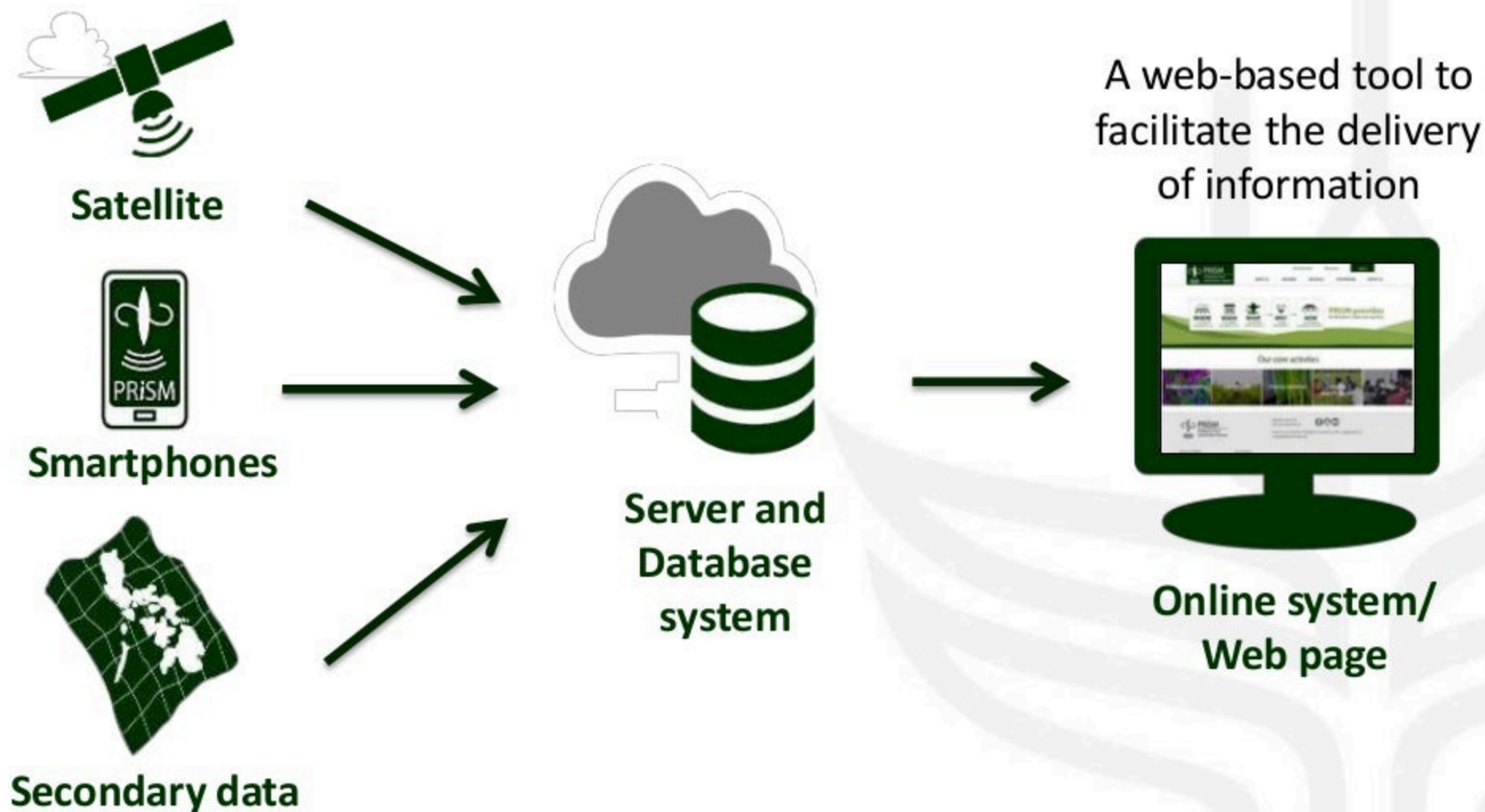


University of Milan
www.unimi.it

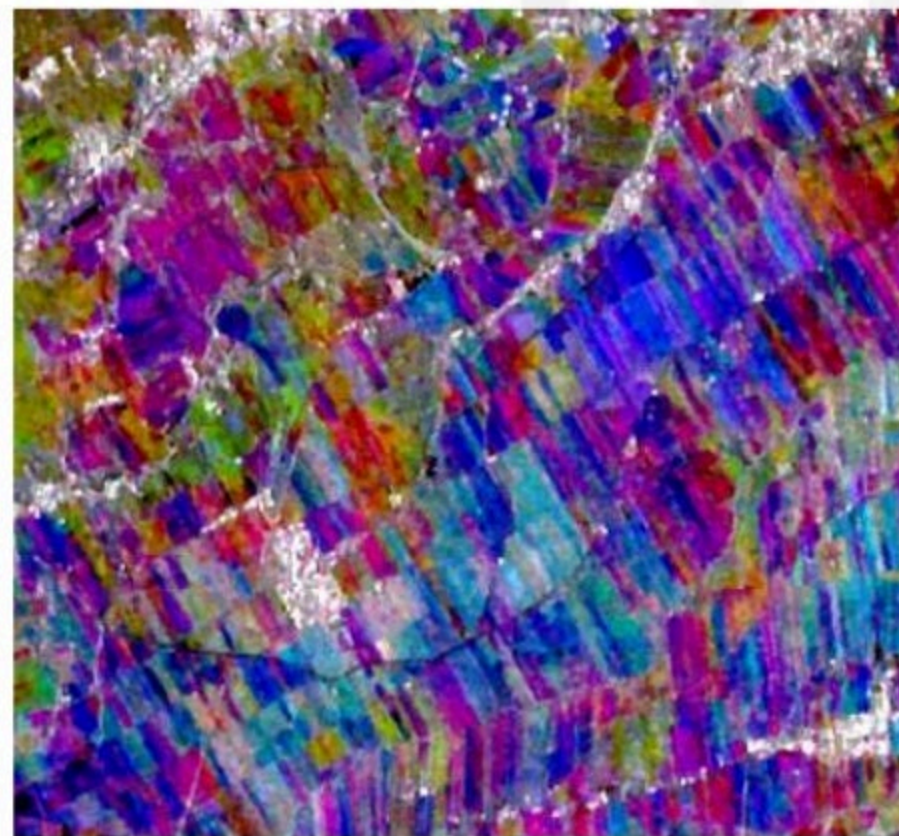
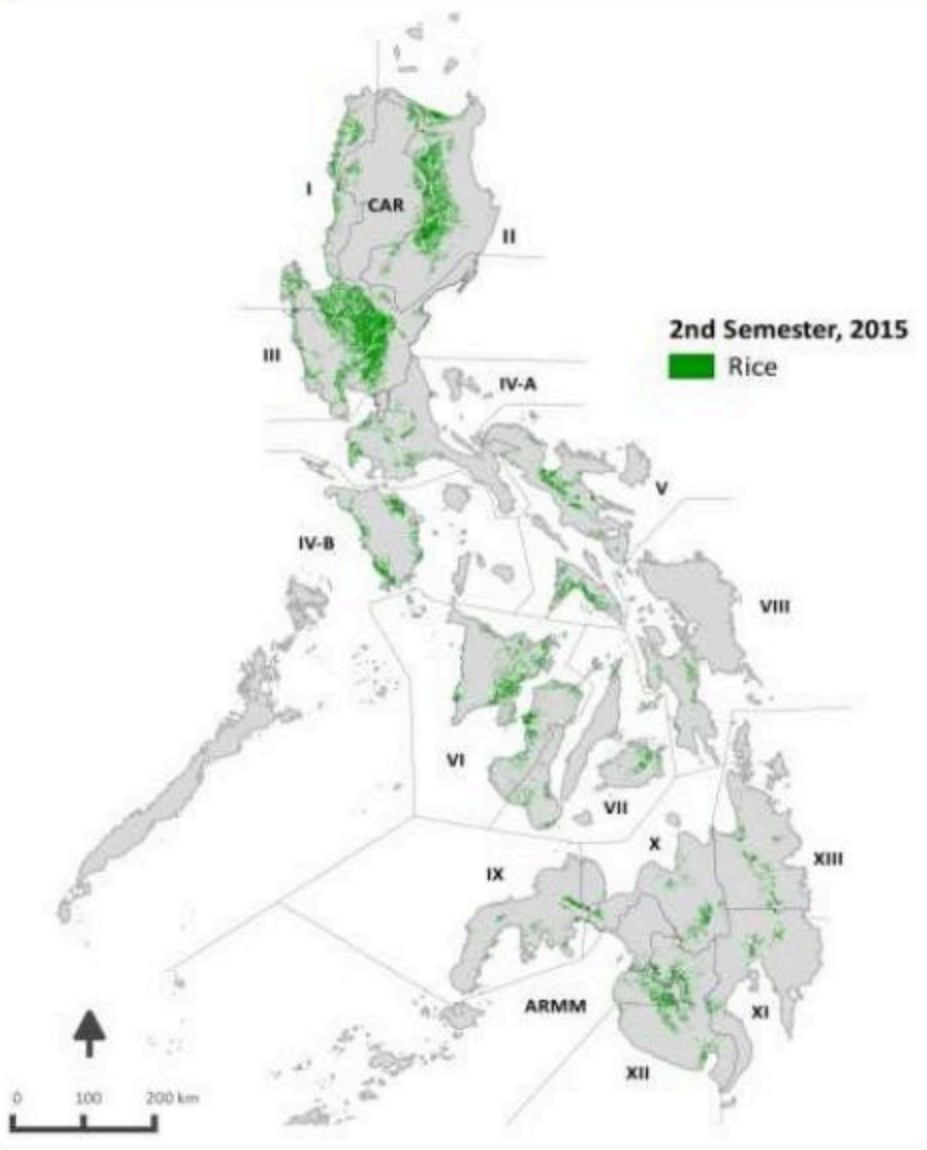


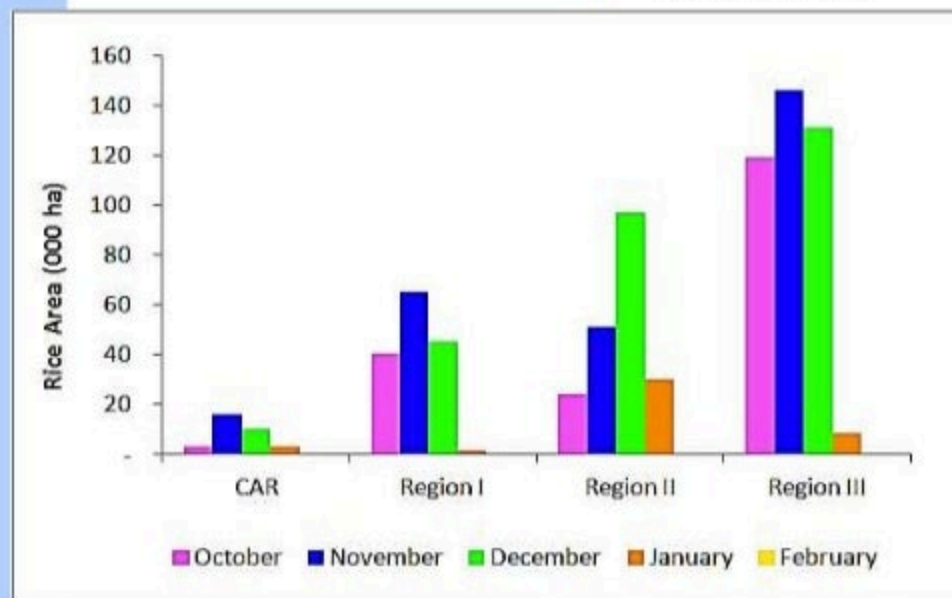
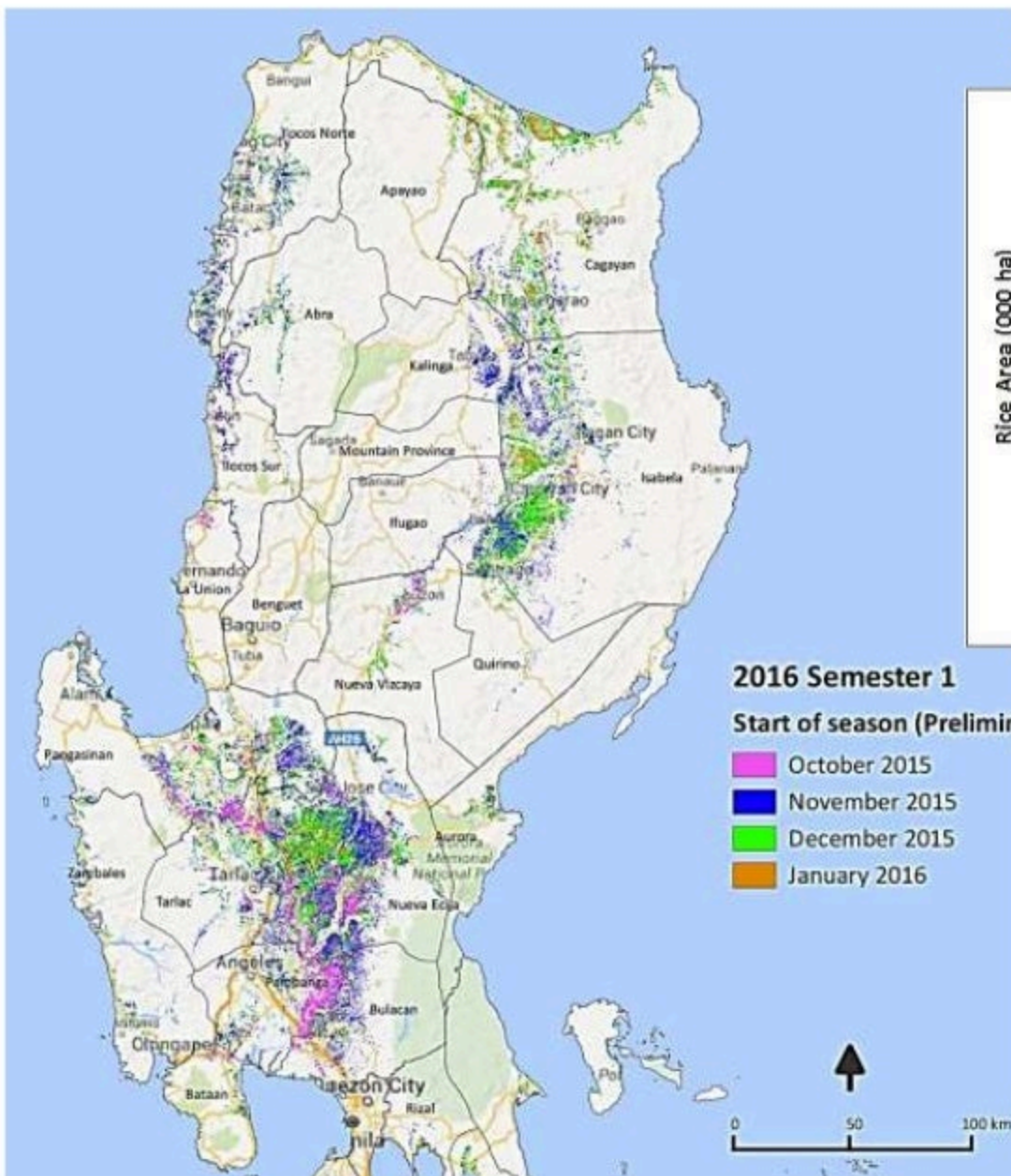
IRRI
International Rice Research Institute
www.irri.org

Web-based information system



From high resolution Synthetic Aperture Radar

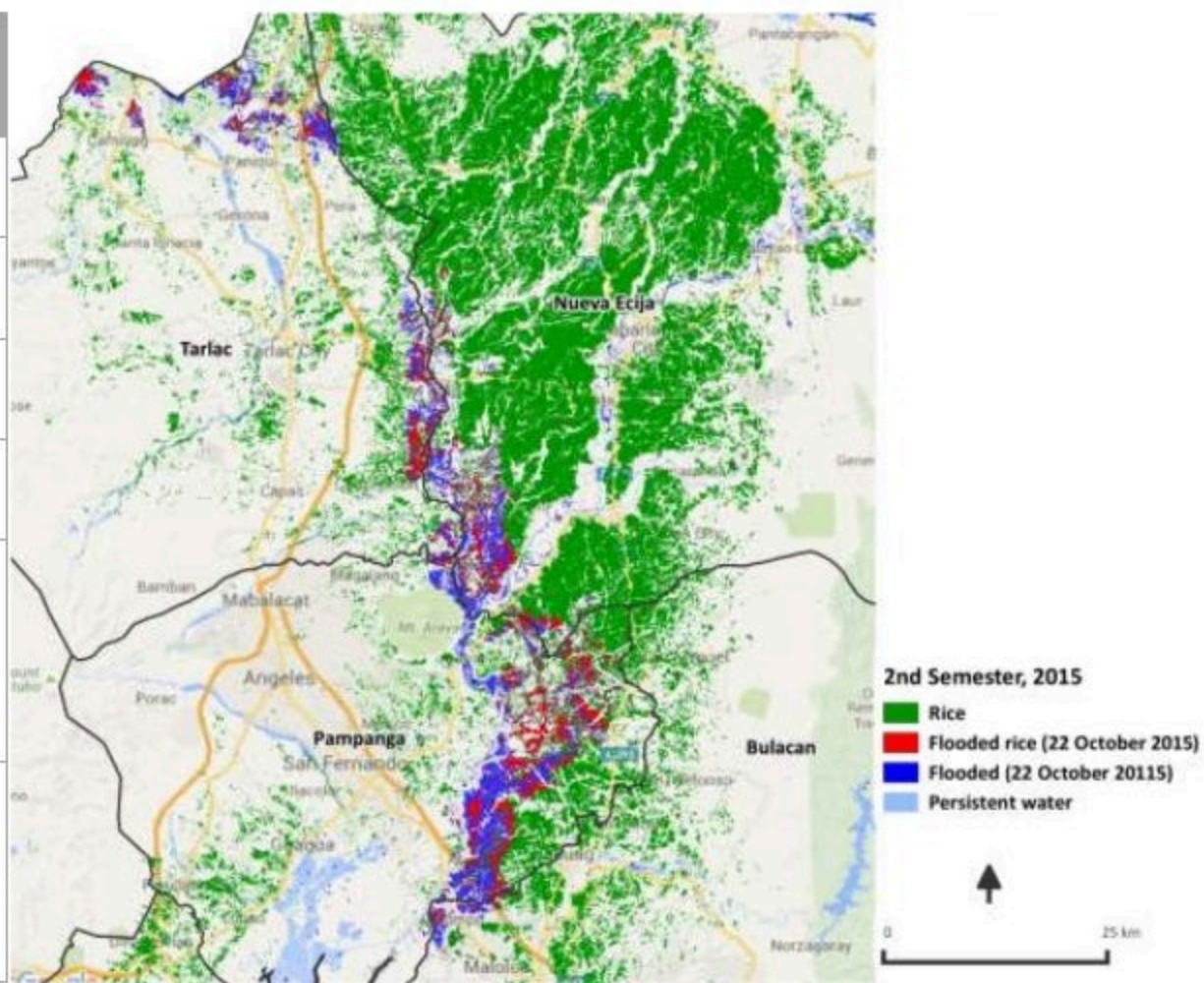




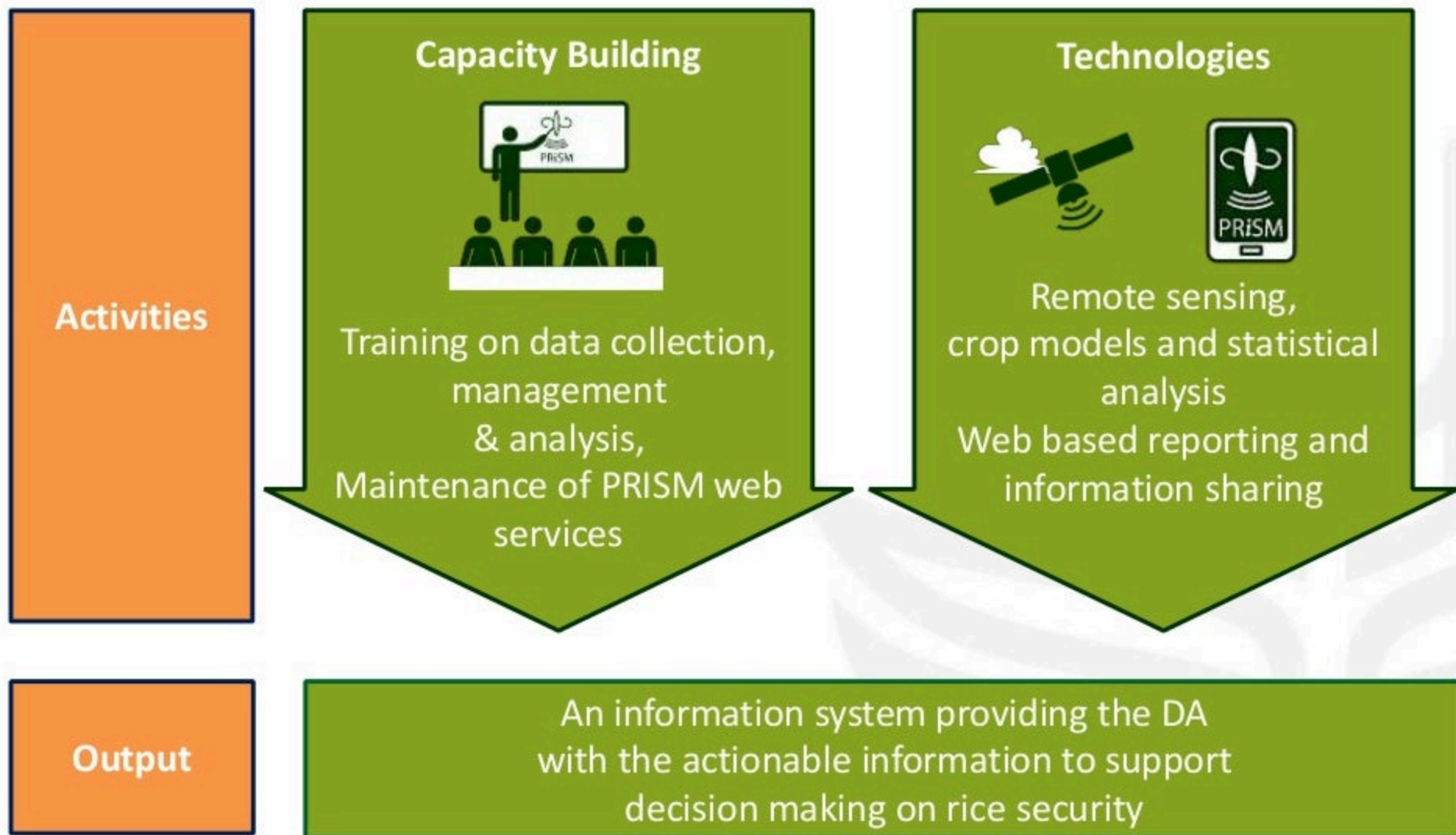
- reveals heterogeneity in planting
- shows if a cropping season is early or delayed
- may reveal areas where there are constraints

Flooded rice areas due to Typhoon Koppu

Month Year	Typhoon Name	Affected regions
July 2014	Glenda (Rammasun)	Region V Region VIII
September 2014	Mario (Fung-wong)	Region III
December 2014	Ruby (Hagupit)	Region IVA Region VIII
October 2015	Kabayan (Mujigae)	Region III
October 2015	Lando (Koppu)	CAR Region I Region II Region III Region IVA
December 2015	Nona (Melor)	Region III Region IVA Region V Region VI Region VIII



PRISM



An Integrated Programmatic Approach to Aquaculture based on three Technology Platforms



ABASSA STATION IN COLLABORATION WITH EGYPTIAN GOVERNMENT.
Program on tilapia
Abbassa Strain Technologies (breeds, feeds, husbandry methods for sub-Saharan Africa).
Disease epidemiology.

With **BANGLADESH DOF** – carps
Technologies (breeds, feeds, husbandry methods).
Disease epidemiology.

JITRA STATION: IN COLLABORATION WITH MALAYSIA DOF:
Program on tilapia GIFT Jitra Strain Technologies (breeds, feeds, husbandry methods for Asia and globally).

WorldFish Laboratories and Biorepository



- **Systematic tissue sampling all broodstock (all breeding programs)**
- **Building repository of tissues to support genomic work**
- **Need to develop better germline preservation (not just sperm) – primordial cells??**

Policy advice derived from research experience



Options for agriculture at Marrakech climate talks:
messages for SBSTA 45 agriculture negotiators



Edited by
Dhanush Chinn
Sangeeta Vermaulen



Nutrition-sensitive agriculture and rural development



Scaling up note



© IFAD/Photo: F. A. J. /
Guinea - Paulo Dillen Agricultural Rehabilitation
Project

Scaling up results in nutrition-sensitive
agriculture and rural development

The new CGIAR Strategy 2016–2030:

- Guides the development and implementation of an ambitious portfolio of second-generation CGIAR Research Programs ([CRPs](#))
- Focuses on selected grand challenges, by 2030 it will contribute significantly to the achievement of key Sustainable Development Goals ([SDGs](#))
- Highlights a return on investment evaluated at US\$17 for every US\$1 put into CGIAR over its lifetime



CGIAR's ambitious 2030 goals

CGIAR has 3 goals, or *System Level Outcomes (SLOs)*, through which we aim to:



REDUCE
POVERTY



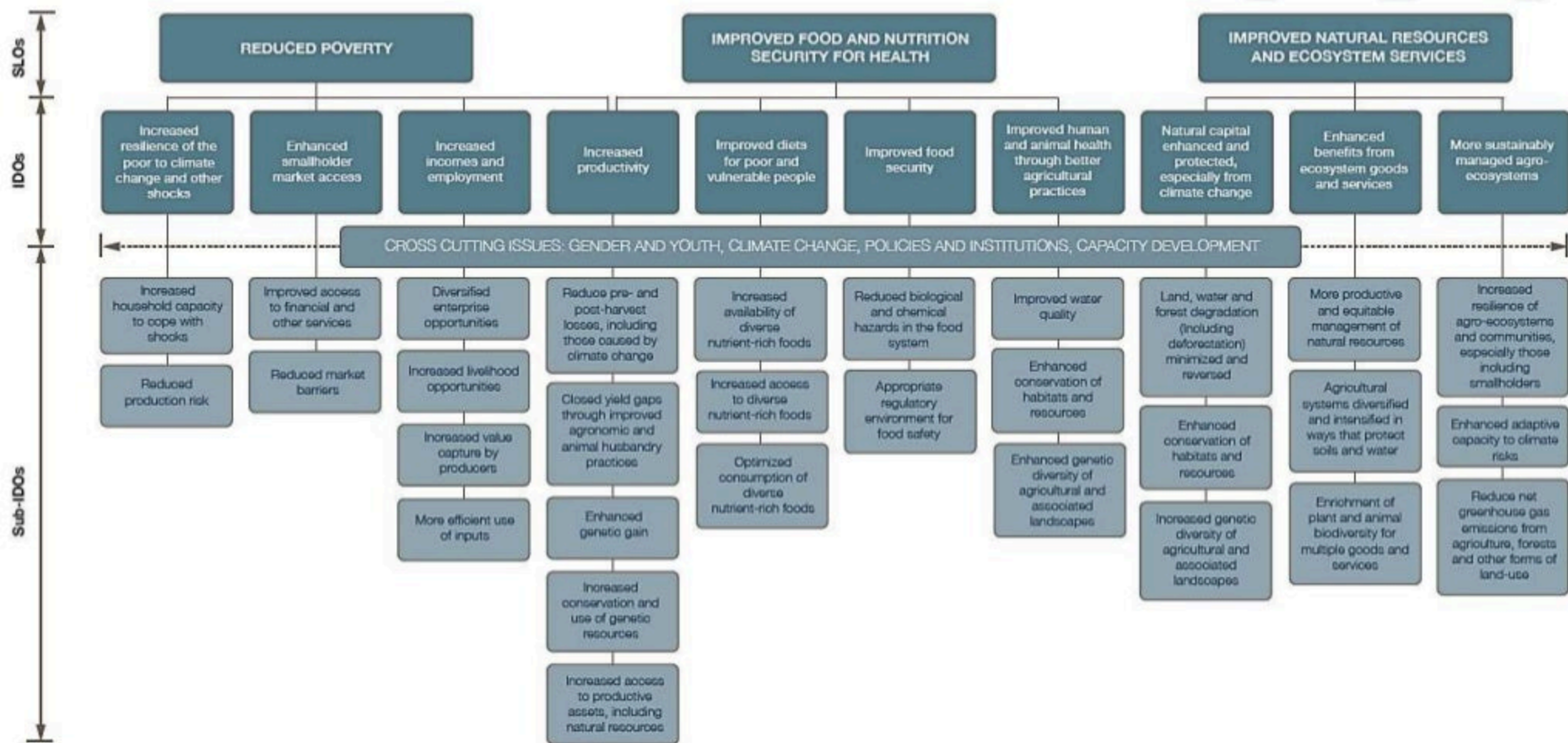
IMPROVE
FOOD AND
NUTRITION
SECURITY



IMPROVE
NATURAL
RESOURCES AND
ECOSYSTEM
SERVICES

CGIAR Results Framework

Centers and donors have a collective responsibility for the performance and results of the system



CGIAR Research Programs & platforms (newly designed for 2017-2022)



Maize

Wheat

Rice

Roots, Tubers and Bananas (RTB)

Livestock

Fish

Forests, Trees and Agroforestry (FTA)

Agriculture for Nutrition and Health (A4NH)

Climate Change, Agriculture and Food Security
(CCAFS)

Policies, Institutions and Markets (PIM)

Water, Land and Ecosystems (WLE)

Genebanks Platform

Excellence in Breeding Platform

Big Data Platform



Cross-cutting Themes

- Gender & youth
- **Capacity Development**
- Climate change
- Policies and institutions



Capacity Development and CGIAR

- Capacity Development (CapDev) is considered to be a strategic enabler of impact for CGIAR, particularly through building and sustaining capacity in national systems
- CapDev activities contribute to the achievement of four key intermediate development outcomes:
 - Enhanced institutional capacity of partner research organisations
 - Enhanced individual capacity in partner research organisations through training and exchange
 - Increased capacity for innovation in partner research organisations
 - Increased capacity for innovation in partner development organisations, and in poor and vulnerable communities
- CGIAR CapDev goes beyond the transfer of knowledge and skills through training.
- CapDev by CGIAR cuts across multiple levels: individual, community, organisation and system
- CapDev in the CGIAR Research programs is guided by a CapDev Framework

CapDev in CGIAR: Practical opportunities (1)

Fellowships

- Different types of fellowships are offered by most CGIAR centers-
 - Graduate Fellows
 - Research Fellows
- Thematic fellowships- e.g Gender Fellowships offered through the CGIAR Gender Network
- African Women in Agricultural Research and Development (AWARD): AWARD is a career-development program that since 2008 has, through tailored fellowships, equipped top women agricultural scientists across sub-Saharan Africa to accelerate agricultural gains by strengthening their science and leadership skills.

Internships

Providing real 'work' experiences within research institutes and projects

e.g CRP on Dryland Cereals and RUFORUM internships

MSc and PhD Studies

Students are supervised by CGIAR scientists and get an opportunity to work on a CGIAR program.

CapDev in CGIAR: Practical opportunities (2)

Training courses

Training courses are offered by many CGIAR Centers and Research programs...

- ...on a variety of subjects
- ...short, medium and long timeframes
- ...face to face and online

Training materials

Training materials are developed across CGIAR-using...

- Knowledge from research
- Adult learning theory
- Instructional design

Training facilities

There are many great capacity development facilities across CGIAR.

e.g Biosciences eastern and central Africa – International Livestock Research Institute (BecA-ILRI) Hub

The BecA-ILRI Hub is a shared agricultural research and biosciences platform that exists to increase access to affordable, world-class research facilities. Located at and managed by ILRI in Nairobi, Kenya, the BecA-ILRI Hub provides a common biosciences research platform, research-related services and capacity building opportunities to eastern and central Africa and beyond.

CapDev in CGIAR: Practical opportunities (3)

Alternative learning approaches and technologies

- Blended learning: delivery of content and instruction via digital and online media
- Learning management systems: technology systems that offer functionalities for learning
- E-learning

Action learning

- Collaborative research activities
- Coaching
- RAAIS (Rapid Appraisal of Agricultural Innovation Systems)
- Multi-stakeholder processes

Conclusion

The [Sustainable Development Goals](#), the [Paris Climate Agreement](#), the [Japanese Government's TICAD initiative](#) - all recognize the importance of healthy diets and sustainable agri-food systems - provide strong direction and a renewed mandate for agri-food research – and the CGIAR new Strategy and Results Framework is aligned to this development agenda.





Our Fund Donors (2015)

Thanks to our donors, CGIAR research has transformed the lives of hundreds of millions of people through tangible research and development outcomes.

Abu Dhabi	International Development	Norway
Australia	Research Centre	Portugal
Austria	India	South Africa
Bangladesh	International Fund for Agricultural	Sudan
Belgium	Development	Sweden
Bill & Melinda Gates Foundation	Ireland	Switzerland
Canada	Japan	Thailand
China	Korea	Turkey
Denmark	Luxembourg	United Kingdom
Finland	Netherlands	United States of America
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Thank you

